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Mazdoor Kisan Shakti Sangathan

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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8507-4-1 (1983): Fixed Insulated Hermetically Sealed Tantalum Capacitors with Solid Electrolyte, Part 4: Type FCST 3, Section 1: Polar [LITD 5: Semiconductor and Other Electronic Components and Devices]

“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartṛhari—Nītiśatakam

“Knowledge is such a treasure which cannot be stolen”



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Indian Standard

**SPECIFICATION FOR
FIXED INSULATED HERMETICALLY SEALED TANTALUM
CAPACITORS WITH SOLID ELECTROLYTE
PART 4 TYPE FCST 3
Section 1 Polar**

0. General — This standard shall be read in conjunction with IS : 8507 (Part 1)-1977 'Specification for fixed insulated, hermetically sealed tantalum capacitors with solid electrolyte : Part 1 General requirements and methods of tests'.

1. Scope — This standard covers the detail requirements for capacitors, fixed with solid tantalum electrolytic, polar, moulded in construction with axial leadouts.

2. Outline Drawing and Dimensions — The outline drawing and dimensions shall be according to Fig. 1 and Tables 1 and 2.

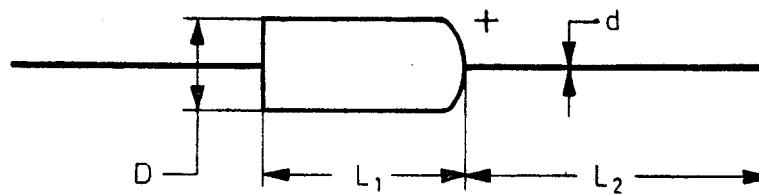


FIG. 1 OUTLINE DRAWING AND DIMENSIONS

TABLE 1 DIMENSIONS

Size	$L_1 \pm 1.0$	$D \pm 0.2$	$d \pm 0.13$	L_2, Min
(1)	(2)	(3)	(4)	(5)
MA 1	8.00	3.50	0.51	30.00
MA 2	9.50	4.00	0.51	30.00
MB	12.50	4.70	0.51	30.00
MC	17.40	7.30	0.64	30.00
MD	19.80	8.80	0.64	30.00

TABLE 2 CAPACITANCE VALUE, WORKING VOLTAGE AND SIZES
(Clause 2)

Volts V Cap μ F	6 V	10 V	15 V	20 V	25 V	35 V
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0.1	A	A	A	A	A	A
0.15	A	A	A	A	A	A
0.22	A	A	A	A	A	A
0.33	A	A	A	A	A	A
0.47	A	A	A	A	A	A
0.68	A	A	A	A	A	A
1.0	A	A	A	A	A	A
1.5	A	A	A	A	A	B
2.2	A	A	A	A	B	B
3.3	A	A	A	B	B	B
4.7	A	A	B	B	B	B
6.8	A	B	B	B	B	B
10	B	B	B	B	B	C
15	B	B	B	B	C	C
22	B	B	B	C	C	C
33	B	B	C	C	C	D
47	B	C	C	C	D	D
68	C	C	C	D	D	—
100	C	C	D	D	—	—
150	C	D	D	—	—	—
220	D	D	—	—	—	—
330	D	—	—	—	—	—

3. Ratings and Characteristics

a) Rated capacitance	See 4.1 of IS : 8507 (Part 1)-1977
b) Selection tolerance	$\pm 10, \pm 20$ percent
c) Rated voltage	See Table 3
d) Category voltage	See Table 3
e) Surge voltage	See Table 3
f) Rated temperature	$+ 70^{\circ}\text{C}$ (Derating in accordance with Table 3 from $+70$ to 85°C)
g) Vibration	10-2 000 Hz, 100 m/s^2 3×3 h
h) Bump	1 000 bumps, 400 m/s^2
j) Shock	1 km/s^2
k) Acceleration	20 000 g
m) Climatic category	40/85/21
n) Low air pressure	2 kPa

TABLE 3 RATED VOLTAGE (U_R) CATEGORY VOLTAGE (U_C) AND SURGE VOLTAGE (U_S)

$\frac{U_R}{V}$ (at 70°C)	$\frac{U_C}{V}$ (at 85°C)	$\frac{U_S}{V}$ (at 70°C)
6	4	8
10	7	13
15	10	20
20	13	26
25	20	33
35	23	46

4. Marking — See 7 of IS : 8507(Part 1)-1977.

5. Construction and Workmanship — See 5 of IS : 8507(Part 1)-1977.

6. Classification of Tests — See 8.1 of IS : 8507(Part 1)-1977.

6.1 General Conditions for Tests — See 8.2 of IS : 8507(Part 1)-1977. The same measuring set shall be used for any one test but not necessarily for all the tests.

6.1.1 The test schedule and requirements shall be in accordance with Table 4.

TABLE 4 TEST SCHEDULE AND REQUIREMENTS
(Clause 6.1.1)

SI No.	Test	Clause Ref in IS : 8507 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
i) All Samples				
a)	Visual examination	8.4.1	—	The workmanship and finish shall be satisfactory. The marking shall be legible
b)	Dimensions	8.4.2	—	The dimensions shall conform to values given in Table 1 read with Fig. 1.
c)	Capacitance	8.3.2	—	The capacitance value shall correspond with the rated capacitance taking into account the tolerance
d)	Tangent of loss angle	8.3.2	—	The values shall not exceed:
				<i>Rated Voltage</i> <i>Tan δ</i>
				6 and 10 V 10 percent
				15 and 20 V 8 percent
				25 and 35 V 6 percent
e)	Leakage current	8.3.1	—	Leakage current shall not exceed 0.02 μ A/ μ F-V, or 1 μ A whichever is greater
f)	Voltage proof test	8.3.4	—	There shall be no breakdown or flash-over
g)	Insulation resistance	8.3.5	—	Insulation resistance shall not be less than 1 000 M Ω
ii) First Group				
a)	Solderability	8.4.4	—	The termination shall get wet easily and the tinning shall be uniform and good
b)	Robustness of terminations	8.4.3	—	—
1)	Visual examination	8.4.1	—	There shall be no damage
c)	Bump	8.4.6	1 000 bumps, 400 m/s ²	—
1)	Visual examination	8.4.1	—	There shall be no damage
2)	Capacitance	8.3.2	—	Change in capacitance value shall not exceed \pm 8 percent from the value recorded in (i) (c)
3)	Tangent of loss angle	8.3.3	—	Shall not exceed:
				<i>Rated Voltage</i> <i>Tan δ</i>
				6 and 10 V 15 percent
				15 and 20 V 12 percent
				25 and 35 V 9 percent
4)	Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater.
d)	Vibration	8.4.5	10-2 000 Hz, 100 m/s ² , 3 \times 3 h	—
1)	Visual examination	8.4.1	—	There shall be no damage
2)	Capacitance	8.3.2	—	Change in capacitance value shall not exceed \pm 8 percent from the value recorded in (i) (c)

(Continued)

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8507 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
	3) Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
	4) Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater
e)	Shock	8.4.7	—	—
	1) Visual examination	8.4.1	—	There shall be no damage
	2) Capacitance	8.3.2	—	Capacitance value shall not exceed ± 8 percent from the value recorded in (i) (c)
	3) Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
	4) Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater
f)	Acceleration (steady state)	8.4.8	20 000 g	—
	1) Visual examination	8.4.1	—	There shall be no damage
	2) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 8 percent from the value recorded in (i) (c)
	3) Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
	4) Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater
g)	Rapid change of temperature	8.5.3	—	—
	1) Visual examination	8.4.1	—	There shall be no damage
	2) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 8 percent from the value recorded in (i) (c)
	3) Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
	4) Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater
h)	Climatic sequence	8.5.1	—	—

(*Continued*)

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8507 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
1)	Dry heat	8.5.1.2	At maximum category temperature (+85°C) for 16 h	—
2)	Damp heat (accelerated) First cycle	8.5.1.3	—	—
	i) Visual examination	8.4.1	—	There shall be no damage
3)	Cold	9.5.1.4	At minimum category temperature (-40°C) for 2 h	—
	i) Visual examination	8.4.1	—	There shall be no damage
4)	Low air pressure	8.5.1.5	Degree of severity (2 kPa)	There shall be no breakdown or flash over
5)	Damp heat (accelerated) remaining cycles	8.5.1.6	1 cycle	—
	i) Visual examination	8.4.1	—	There shall be no damage
	ii) Voltage proof	8.3.4	—	There shall be no breakdown or flash over
	iii) Insulation resistance	8.3.5	—	100 M Ω (Min)
	iv) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 8 percent from the value recorded in (i) (c)
	v) Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
	vi) Leakage current	8.3.1	—	Shall not exceed 0.04 μA/μF-V or 2 μA whichever is greater
iii) Second Group				
a)	Damp heat (long term)	8.5.2	21 days	—
1)	Visual examination	8.4.1	—	There shall be no damage
2)	Voltage proof	8.3.4	—	There shall be no breakdown or flash over
3)	Insulation resistance	8.3.5	—	100 M Ω (Min)
4)	Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 8 percent from the value recorded in (i) (c)
5)	Tangent of loss angle	8.3.3	—	Shall not exceed: <i>Rated Voltage</i> <i>Tan δ</i> 6 and 10 V 15 percent 15 and 20 V 12 percent 25 and 35 V 9 percent
6)	Leakage current	8.3.1	—	Shall not exceed 0.04 μA/μF-V or 2 μA whichever is greater

(*Continued*)

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8507 (Part 1)-1977	Conditions of Test	Requirements								
(1)	(2)	(3)	(4)	(5)								
iv) Third Group												
a) Endurance	8.7	—	—	—								
1) Visual examination	8.4.1	—	—	There shall be no damage								
2) Capacitance	8.3.2	—	—	The change in capacitance value shall not exceed ± 15 percent from the value recorded in (i) (c)								
3) Tangent of loss angle	8.3.3	—	—	Shall not exceed: <table> <thead> <tr> <th>Rated Voltage</th> <th>Tan δ</th> </tr> </thead> <tbody> <tr> <td>6 and 10 V</td> <td>20 percent</td> </tr> <tr> <td>15 and 20 V</td> <td>16 percent</td> </tr> <tr> <td>25 and 35 V</td> <td>12 percent</td> </tr> </tbody> </table>	Rated Voltage	Tan δ	6 and 10 V	20 percent	15 and 20 V	16 percent	25 and 35 V	12 percent
Rated Voltage	Tan δ											
6 and 10 V	20 percent											
15 and 20 V	16 percent											
25 and 35 V	12 percent											
4) Leakage current	8.3.1	—	—	Shall not exceed $0.03 \mu\text{A}/\mu\text{F-V}$ or $1.5 \mu\text{A}$ whichever is greater								
v) Fourth Group												
a) Reverse voltage	8.9	—	—	—								
b) Mould growth	8.5.5	—	—	There shall be no mould growth								
vi) Fifth Group												
a) Resistance to soldering heat	8.4.4.2	—	—	—								
1) Capacitance	8.3.2	—	—	The change in capacitance value shall not exceed ± 5 percent from the value recorded in (i) (c)								
2) Tangent of loss angle	8.3.3	—	—	Shall not exceed: <table> <thead> <tr> <th>Rated Voltage</th> <th>Tan δ</th> </tr> </thead> <tbody> <tr> <td>6 and 10 V</td> <td>15 percent</td> </tr> <tr> <td>15 and 20 V</td> <td>12 percent</td> </tr> <tr> <td>25 and 35 V</td> <td>9 percent</td> </tr> </tbody> </table>	Rated Voltage	Tan δ	6 and 10 V	15 percent	15 and 20 V	12 percent	25 and 35 V	9 percent
Rated Voltage	Tan δ											
6 and 10 V	15 percent											
15 and 20 V	12 percent											
25 and 35 V	9 percent											
3) Leakage current	8.3.1	—	—	Shall not exceed $0.03 \mu\text{A}/\mu\text{F-V}$ or $3 \mu\text{A}$ whichever is greater								
b) Resistance to solvents (see Note 1)	8.4.9	—	—	—								
vii) Sixth Group												
a) Characteristics at low and high temperature (see Note 2)	8.6	—	—	—								
Step 1 at $+25^\circ\text{C}$												
1) Capacitance	8.3.2	—	—	As per initial limits								
2) Tangent of loss angle	8.3.3	—	—	As per initial limits								
3) Leakage current	8.3.1	—	—	As per initial limits								
Step 2 at -40°C												
1) Capacitance	8.3.2	—	—	Change in capacitance value shall not exceed ± 12 percent from the value recorded at Step 1								

(*Continued*)

TABLE 4 TEST SCHEDULE AND REQUIREMENTS — *Contd*

SI No.	Test	Clause Ref in IS : 8507 (Part 1)-1977	Conditions of Test	Requirements
(1)	(2)	(3)	(4)	(5)
2) Tangent of loss angle	8.3.3	—	Shall not exceed:	
			<i>Rated Voltage</i>	<i>Tan δ</i>
			6 and 10 V	15 percent
			15 and 20 V	12 percent
			25 and 35 V	9 percent
Step 3 at + 25°C				
1) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 2 percent from the value recorded at Step 1	
2) Tangent of loss angle	8.3.3	—	As per the initial limits	
3) Leakage current	8.3.1	—	As per the initial limits	
Step 4 at + 85°C				
1) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 15 percent from the value recorded at Step 1	
2) Tangent of loss angle	8.3.3	—	Shall not exceed:	
			<i>Rated Voltage</i>	<i>Tan δ</i>
			6 and 10 V	15 percent
			15 and 20 V	12 percent
			25 and 35 V	9 percent
3) Leakage current	8.3.1	—	Shall not exceed 12.5 times the value from the initial limits	
Step 5 at 27°C (ambient)				
1) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 2 percent from the value recorded at Step 1	
2) Tangent of loss angle	8.3.3	—	As per initial limits	
3) Leakage current	8.3.1	—	As per initial limits	
b) Surge test	8.8	—	—	
1) Capacitance	8.3.2	—	Change in capacitance value shall not exceed ± 10 percent of the value recorded at Step 1	
2) Tangent of loss angle	8.3.3	—	Shall not exceed:	
			<i>Rated Voltage</i>	<i>Tan δ</i>
			6 and 10 V	15 percent
			15 and 20 V	12 percent
			25 and 35 V	9 percent
3) Leakage current	8.3.1	—	Shall not exceed 0.04 μ A/ μ F-V or 2 μ A whichever is greater	
c) Salt mist test	8.5.4	—	—	
1) Visual examination	8.4.1	—	There shall be no damage	
2) Leakage current	8.3.1	—	As per initial limits	

Note 1 — This test is originally meant to withstand the printing on the capacitor bodies (metal can types). Since the moulded capacitors use epoxy moulding powders this test need not be conducted.

Note 2 — Measurements are to be made before the start of the test for all comparison purposes and recorded.